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Article Title: A Closer Look at How Self-Talk Influences Skilled Basketball Performance

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Abstract

Empirical literature addressing the effectiveness of self-talk for expert performers is lacking. We addressed this shortcoming within the existent literature and examined the comparative effects of instructional and motivational self-talk on basketball free throw shooting accuracy and salient movement kinematics. We recruited twenty professional basketball players to participate in a 2 x 2 pre/post-test experiment. Free throw accuracy and movement patterns were recorded, with the latter subsequently used to calculate elbow-wrist coordination variability. Results indicated superior shooting accuracy and reduced movement coordination variability for instructional self-talk compared to baseline conditions whereas, no differences emerged for motivational self-talk. Findings from the study help practitioners to better guide skilled performers how best to use self-talk; an area in urgent need of further research.

Keywords: instructional self-talk, motivational self-talk, coordination variability, accuracy, professional sport

Self-talk can be viewed as statements, phrases or cue words addressed to the self that can be said automatically or very strategically, either out loud or silently, phrased positively or negatively, having an instructional or motivational purpose, an element of interpretation, and incorporating some of the same grammatical features associated with every day speech (Hardy & Zourbanos, 2016). Alternatively and put more simply, self-talk represents things an individual says to himself/herself, which can be said both internally and silently or externally and out loud (Harvey, Van Raalte, & Brewer, 2002). There is evidence across a number of sports that supports the idea that self-talk can be beneficial for athletes participating in a variety of sports such as; badminton (Theodorakis, Weinberg, Natsis, Douma, & Kazakas, 2000 Experiment 2), basketball (Perkos, Theodorakis, & Chroni, 2002), cycling (Blanchfield, Hardy, De Morree, Staiano, & Marcora, 2014), golf (Harvey et al., 2002), soccer (Theodorakis et al., 2000 Experiment 1), tennis (Hatzigeorgiadis, Zourbanos, Mpoumpaki, & Theodorakis, 2009), as well as track and field (Mallett & Hanrahan, 1997). Furthermore, studies have investigated the effectiveness of self-talk for facilitating the acquisition of different skills within the same sport. For instance, novice basketball players aged 12 years old demonstrated a benefit using self-talk on dribbling and passing but not a shooting task (Perkos et al., 2002). Overall, empricial evidence supports the use of self-talk as a performance oriented cognitive strategy.

However, different types of self-talk have emerged within the sports literature and appear to yield differential effects for performance (Tod, Hardy, & Oliver, 2011). More specifically, Theodorakis et al. (2000) hypothesised that instructional self-talk (e.g., "ball … step … swing") to be more effective than motivational self-talk (e.g., "I can do this") for precision and outcome-based motor skills. The opposite was expected for motor skills requiring strength and endurance due to the psychophysiological (e.g., mood, confidence, and effort) enducing benefits of motivational self-talk. In the case of accuracy based tasks, instructional self-talk was proposed to be helpful because it facilitates performers' understanding of task requirements helping them to attend to task relevant cues aiding their concentration during task execution. Research using basketball tasks has reported that university students assigned to an instructional self-talk group, as compared to motivational self-talk or a control group, demonstrated a significant and superior learning effect for a passing accuracy task. No differences emerged on the experiment’s passing speed or shooting accuracy tasks (Boroujeni, Zourbanos, & Shahbazi, 2014). When considering the collective emprirical literature inspired by this task demand match hypothesis, two systematic reviews concluded with some support for its predictions and the positive effects of self-talk on performance (Hatzigeorgiadis, Zourbanos, Galanis, & Theordorakis, 2011; Tod et al., 2011). Additionally both reviews identified factors that might explain some of the inconsistencies in the available data as well as areas in need of further investigation. One such theme is concerned with the skill level of participants recruited for experiments. In particular, the use of extremely competent and highly skilled athletes at the more automated stage of learning (Fitts & Posner, 1967) is scarce. Hence it remains unclear whether or not the findings pertaining to the task demand matching hypothesis gleaned from samples representative of the early stages of learning generalize to the more advanced sports performer.

An initial investigation of direct relevance to the comparative effectiveness of instructional and motivational self-talk in skilled athletes examined specialist free-kick takers’ execution of free-kicks in the sport of Gaelic football (Hardy, Begley, & Blanchfield, 2015). When these athletes carried out the 22m kicking accuracy task with their dominent foot they performed significantly better using motivational rather than instructional self-talk. The authors suggested that the use of instructional self-talk encouraged the adoption of an internal focus of attention (i.e, attending to movements of the body; Wulf, McNevin, & Shea, 2001) during task execution that has been theorised to constrain automated processing ultimately undermining execution, particularly for skilled athletes (e.g., Bell & Hardy, 2009). A complementary explanation draws from Masters and Maxwell’s (2008) theory of reinvestment, which attributes similar decrements in performance to the athlete consciously processing how to execute the well learned skill. Whereas Hardy et al.’s data are consistent with these interpretations, two issues—choice of task and study design—are noteworthy. The demands of the free kick task used emphasize accuracy (i.e., the ball needs to go between the posts) as well as a blend of well coordinated, power-based gross motor activity and so is relatively atypical of the fine motor skills (e.g., a short basketball pass) commonly used in the literature. When this is combined with the use of a repeated measures study design without a control condition, it is unknown whether instructional self-talk degrades accuracy or motivational self-talk assists execution of this type of task. Hardy et al. acknowledged the above concerns and recommended the need for continued investigation of the matching hypothesis with elite performers. This forms one of the objectives of the current research.

Pivotal to the matching hypothesis for effective self-talk interventions is an appreciation of the task demands confronted by the athlete and how these often vary across skills even within the same sport, as intimated through the previously highlighted basketball studies. In fact, varying task demands is one reason suggested by researchers to explain why self-talk can aid simpler basketball tasks (e.g., passing) but not the more complex skills such as shooting. An additional possibility is that the participants involved in the studies were relatively unskilled and so lacked the necessary familiarity and understanding of the task requirements to be able to effectively use the instructional self-talk cues provided (cf. Hardy & Callow, 1999). As far as basketball shooting is concerned, there is more to successful execution than accurate aiming of the throw alone. For example, coaches expect to observe coordinated and consistent movement patterns in their players in order to increase throw accuracy and reduce movement errors when shooting free throws (Wissel, 2011). Furthermore, Liu, Chiang, and Mayer-Kress (2006) findings confirm the influence of movement coordination on shooting accuracy and stability. As a result, it appears that the main requirements of basketball free throw shooting are throwing accuracy *and* reaching a coordinated and stable movement pattern. Given that importance of coordinated kinematics and the limited evidence that self-talk interventions might impact on the biomechanical nature of executing tasks (see Edwards, Tod, & McGuigan, 2008; Tod, Thatcher, McGuigan, & Thatcher, 2009), comparing the movement coordination variability associated with instructional and motivational self-talk was another objective for the present study. Targetting movement coordination afforded us the opportunity to examine more closely how self-talk might influence skilled accuracy-oriented performance. In fact, despite the importance of technique in precision based skill execution and the dominance of such tasks in the self-talk literature, it is surprising that there has not been a previous examination of the influence of self-talk on objectively captured movement kinematics. An investigation that pursued this with professional athletes would not only be the first of its kind, it would also help to clarity the apparent contradiction in the literature concerning skilled performers’ use of instructional self-talk.

Based on professional basketball players well developed knowledge concerning the execution of the basketball free throw shot, we expected our self-talk intervention to bring about performance differences between instructional and motivational self-talk. Although this issue has not yet been systematically addressed, we predicted that skilled performers would be able use instructional self-talk in such a way that led to reduced movement coordination variability and enhanced concomitant shooting accuracy compared to baseline levels. On the other hand, no changes were hypothesized for motivational self-talk.

Method

Participants and study design

We recruited twenty, male, right-handed, basketball players (M_{age} = 23.5, *SD* = 5.5 years) with at least 5 years of experience playing basketball professionally in the Iranian national basketball league. This league is amongst the strongest basketball leagues in Asia and attracts players from Europe and North America. According to Swann, Moran, and Pigott’s (2015) heuristic classification system of elite athletes, our sample is of a competitive elite nature (the second tier in their four tier coding). Participants were randomly assigned to create two groups and completed the experimental (free throw shooting) task under both baseline and post-test conditions.

Measures

Performance accuracy. Using regulation sized basketballs, board and basket, and court, participants completed 20 free throw shots using their dominant hand from the foul line. To assess shooting accuracy we used Wulf, Raupach, and Pfeiffer’s (2005) five point scoring scale. Accordingly attempts were scored as a basket (5 points), hitting the rim (3 points), hitting both the board and rim (2 points), hitting only the board (1 points), or an air shot (neither contacting the basket nor board; 0 points).

Movement coordination variability. To determine movement coordination variability we followed the general approach developed by Mullineaux and Uhl (2010). Eight Osprey infrared cameras (Motion Analysis Corp, USA) were used to collect kinematic data for every free throw taken. To do so, a consistent approach was used for both testing sessions. Specifically, prior to each participants’ warm-up, eight photosensitive markers were affixed to the following locations of the body: head, right shoulder, right arm, right elbow, right wrist, finger, right thigh, and left shoulder. The captured data were analyzed using Cortex software (Motion Analysis Corp, USA) and MATLAB 2012 was used to simulate the movement kinematic information in order to calculate NoRMS (Normalized Root Mean Square) data that were subsequently tested statistically.

Manipulation check. To monitor participants’ engagement with their self-talk cues, after completing their trials, they asked the following two open ended questions; “What were you thinking about whereas performing the skill?" and "Did you think that using self-talk was helpful for your performance?" (cf. Theordorakis et al., 2000).

Procedures

Prior to starting testing Institutional ethical approval was obtained. The accuracy of basketball free throw execution was examined in two testing sessions (without and with self-talk) separated by a 24 hour interval. In the first session (pretest), participants received a 10-minute warm-up including stretching, ball-handling, and then carried out 20 "test" free throws under lab conditions (i.e., in a quiet environment devoid of distractions) using their dominant hand. At the end of the first session, participants were randomly divided into either an instructional or a motivational self-talk group. Upon arrival for the second session (post-test), all participants received a brief evidence-based tutorial concerning self-talk that introduced them to the concept of self-talk, the possible benefits of self-talk, and the particular self-talk phrase they were required to use. The content of the self-talk intervention was based on the self-talk literature (e.g., Landin's 1994 guidelines for verbal cues), the empirically supported kinematic principles of basketball free throws, as well as discussion with expert basketball coaches. As a result, participants assigned to be motivational self-talk group used the phrase "I will be successful" whereas their instructional self-talk counterparts used "ring front, elbow, wrist". The instructional cues provided a reminder to the participants about the outcome of task execution as well as a verbal prime concerning the fundamental features of a successful free throw (without offering excessively specific guidance). The structure of the post-test session was identical to the first session with the exception that participants used their respective self-talk phrases three times prior to each free throw. This was done in both the warm-up phase as well as the test trials. Participants practiced using their self-talk phrase during the warm-up period to give them the opportunity to better familiarize themselves with their cues and increase the effectiveness of the intervention (cf. Hatzigeorgiadis, Theodorakis,

& Zourbanos, 2004). Following completion of the post-test free throws, the manipulation check protocol was administered.

Data analysis – Movement Coordination Quantification

Although basketball shooting is a multi-joint skill, research has identified that movements of joints, especially the elbow and wrist, and their coordination just before releasing the ball, play a determining role in successful task execution (e.g., Button, Macleod, Sanders, & Coleman, 2003; Mullineaux & Uhl, 2010; Robins, Wheat, Irwin, & Bartlett, 2006). Therefore, the present study examined elbow and wrist movements as well as their angle-angle diagrams to provide kinematic data. Mullineaux, Bartlett, and Bennett (2001) modified the NoRMS based formula proposed by Sidaway, Heise, and Schoenfelder Zohdi (1995) for quantifying angle-angle diagram data as well as investigating coordination variability. In the NoRMS based method for quantifying the coordination, standard deviation of data, the data distribution of an attempt, serves as a determining factor. Therefore, a large difference in this index in various attempts will compromise the results (Wheat & Glazier, 2005). To eliminate this problem, Mullineaux et al. (2001) proposed a data assimilation approach from all the attempts. Using MATLAB, the data of all attempts were assimilated through linear, spline, and nearest interpolations methods. As the highest SNR (Signal to Noise Ratio) average was obtained from the spline interpolation method, we used this method in the analyses for quantifying elbow-wrist coordination. Subsequent to data assimilation, Mullineaux et al.'s (2001) formula was used to calculate NoRMS values for each participant in the pre- and post-tests.

Results

Manipulation Check and Descriptive statistics

Responses to the manipulation check questions confirmed that during completion of the trials all participants reported that they were attending to the task and focused on "earning" points, utilizing their self-talk cue, and perceived that it was helpful for performance of the free throw task. The descriptive statistics for the two groups are displayed in Table 1. To aid interpretation, please keep in mind that for accuracy, higher values reflect more accurate task execution whereas for movement coordination variability, lower values of NoRMS indicate higher intra-limb coordination. Inspection of Table 1 reveals a more pronounced effect of self-talk on accurate task execution for instructional self-talk compared to motivational self-talk. A similar pattern of data is apparent when considering movement coordination variability. Independent t-tests established no significant differences between the two groups at baseline.

Performance accuracy

To assess the differential effects of instructional and motivational self-talk on free throw accuracy, we ran a mixed model (2 x 2) group x test ANOVA. This revealed a nonsignificant main effect for group, $F(1, 18) = 1.12$, $p = .303$, $\eta^2 = .06$, although a significant main effect for test, $F(1, 18) = 14.36$, $p = .001$, $\eta^2 = .44$, with superior accuracy demonstrated post-test was evident. Of particular relevance for understanding how the two different types of self-talk impact on accuracy was the presence of a significant interaction between group and test, $F(1, 18) = 6.70$, $p = .017$, $\eta^2 = .28$. An illustration of the data is provided in Figure 1 panel A. Paired *t*-test follow up analyses identified that performance by the instructional self-talk group became significantly more accurate from pre to post-test, $t(9) = 4.39$, $p = .002$, $d = 1.44$ although no improvement in performance accuracy emerged for the motivational self-talk group, $t(9) = .85$, $p = .419$, $d = .25$.

Movement coordination variability

To examine the relative effects of instructional and motivational self-talk on elbow-wrist coordination variability during the free throws, we ran another mixed model (2 x 2) group x test ANOVA. Although a nonsignificant main effect for group emerged, $F(1, 18) = 1.69$, $p =$

.209, η^2 = .086, a significant main effect for test was detected, F(1, 18) = 4.76, p = .043, η^2 = .21. The difference between NoRMS scores for the pre- and post-test session indicating the participants had performed significantly better (i.e., less variability) in the post- rather than pre-test. Although the omnibus interaction between self-talk group and test was nonsignificant, F(1, 18) = .66, p = .43, η^2 = .04, plotting of the data offered suggestive support for differential effects (see Figure 1 panel B). Given the *a priori* hypotheses targeting specific effects for the respective groups and the relatively small number of professional basketball players recruited for the study, which was effectively halved in this interaction component of the ANOVA, we felt that there was adequate merit in more closely examining the data. Considering the elbow-wrist coordination variability for each group separately via paired *t*-tests, revealed different effects across the two self-talk groups. The *t*-test for the instructional self-talk group indicated a significant reduction in elbow-wrist NoRMS over testing sessions, t(9) = 2.29, p = .048, d = 1.32; whereas no difference was present for the coordination variability of the motivation self-talk, t(9) = .91, p = .338, d = .54.

Discussion

The present study begins to fill the void in the research literature concerning the effectiveness of self-talk for highly skilled athletes. Based on the existent empirical literature (e.g., Hatzigeorgiadis et al., 2011), we hypothesized that professional level basketball players utilizing instructional self-talk would reduce movement coordination variability and enhance free throw shooting accuracy whereas those using motivational self-talk would exhibit no changes in their movement kinematics and accuracy compared to baseline. Data supportive of the hypotheses were generated.

On first appearance, these results may seem relatively understated; however, there are a number of important issues. For example, the present investigation of self-talk is one of very few involving expert sports performers; for an exception see Mallet and Hanrahan’s (1997) study with national level sprinters. Our findings are consistent with the very limited literature concerning skilled athletes and performance gains from the use of instructional self-talk (e.g., Mallet & Hanrahan). Of note, within this pocket of literature previous tasks (e.g., sprint running) have tended not to have precision as a hallmark of proficiency, unlike the present task. As a result, previous studies have not examined the second strength of the current investigation, our focus of movement kinematics. From the handful of studies that have examined the effect of self-talk on movement patterns most have involved subjective ratings of task execution (e.g., Landin & Hebert, 1999) and two studies reported changes made to the vertical jumping kinematics of their relatively unskilled participants (e.g., Tod et al., 2009). Although Tod and colleagues were not concerned with the variability of their kinematic data, the effect of self-talk on the variability of motor skill execution has been investigated. Harvey, Van Raalte, and Brewer (2002) reported less variable chip shot outcome due to instructional self-talk used by participants with 6 years golfing experience. Our study is the first to find greater consistency in how athletes using instructional self-talk actually execute their skills. As a result, it suggests that the performance benefits of instructional self-talk for skilled athletes might be attributed to a behavioral mechanism (cf. Tod et al., 2011). However, it is worthwhile keeping in mind that cognitive factors could underpin the changes in the behavioral markers we detected. For instance, Hatzigeorgiadis et al. (2004) demonstrated that instructional self-talk can reduce the number of interfering thoughts experienced by their unskilled participants. It is possible that fewer distractions might lead to more consistent execution of motor actions. Further, behavioral markers involving the consistency of actions have previously been used as observable indicators of conscious thought (e.g., Poolton, Masters, & Maxwell, 2005). When this is combined with self-talk research implicating an automaticity promoting function of self-talk (Theodorakis, Hatzigeorgiadis, & Chroni, 2008), this again reinforces a cognitive basis to our behavioral findings.

With regard to the accuracy of free throw shooting, previous studies that have used basketball shooting tasks consistently reported null effects for the use of self-talk (e.g., Perkos et al., 2002; Boroujeni, & Shahbazi, 2011; Boroujeni, Zourbanos, & Shahbazi, 2014). Considering both task complexity and participants' skill level might help to explain this discrepancy. Bearing in mind the simplified and static nature of tasks commonly used in experiments, Perkos et al. acknowledged that basketball shooting is a more complex motor task than passing and is one that has more emphasis on precision than dribbling. Researchers employing such laboratory based tasks, with relative beginners, have suggested that their results offer support for the effectiveness of self-talk with relatively simplistic tasks (e.g., passing and dribbling) but not for more difficult skills (e.g., shooting). Our findings refute this conclusion. Instead, we contend that the skill level and knowledge base of the performer are important considerations. The current shooting accuracy findings suggest that for more complex skills, the better developed understanding of the task requirements held by elite performers enable them to more effectively use instructional self-talk than their novice like counterparts. However, there remains an avenue for future research to directly test this interpretation and to clarify how skilled participants need to be before they are able to reap the benefit of instructional self-talk when executing complex skills.

The current accuracy oriented findings are in line with Theodorakis et al.'s (2000) matching hypothesis; nevertheless they are out of synch with the results of Hardy et al. (2015), one of the only other studies to examine the effectiveness of skilled athletes' use of instructional and motivational self-talk for precision based tasks. Clearly, this warrants discussion and has the potential to influence both theoretical and practice oriented thinking. The inclusion of a baseline condition in the present study facilitates a better understanding of why the difference between the two types of self-talk might have emerged. Although Hardy et al. previously reasoned that the use instructional self-talk promoted self-referenced thinking, constraining automated processing associated with skilled task execution, the fully repeated measures study design and the potential explosive gross motor requirements of their goal-kicking task leave alternative explanations for debate. In particular, rather than Hardy et al.'s findings attributed to the downside of instructional self-talk, they could be the result and benefit of motivational self-talk (e.g., Hatzigeorgiadis, et al., 2009) although the current data (i.e. the motivational self-talk group did not improve pre to post) counter this interpretation.

An alternative explanation for the different performance findings across the two studies emerges from a closer look at the content of the respective instructional self-talk interventions. Participants in the study by Hardy et al. (2015) used the phrase "One, two, laces and through" to represent phases on the kicking task: the steps before the kick, striking the ball with the top of the foot (i.e., shoelaces), and delivering the ball through the posts and over the crossbar. In contrast are the cues "ring front, elbow, wrist" used in the present study. Drawing from the attentional focus literature it might be expected that the first set of verbal cues that contain a less clear reference to an internal focus of attention should be superior to those used in the present investigation. However, comparing across studies the data contradict this prediction. In fact, the current findings fit well with Toner and Moran's (2015) application of Shusterman's (2008) theory of somaesthetics, outlining the importance of kinaesthetic awareness to enable elite performers to continue to improve even after becoming experts. In fact, Toner and Moran refer to certain situations (e.g., inefficient motor execution) when the use cue words might act as 'instructional nudges' representing verbal aspects of multi-modal embodied routines that aid the distribution of intelligence and coordination of movement patterns.

Additional insight into why instructional self-talk led to enhanced task execution for our professional basketball players might be gleaned from the literature on the theory of reinvestment (Masters & Maxwell, 2008). Within this literature an emphasis is placed on the potential problems of skilled athletes' consciously processing information (under stress). Two types of conscious processing exist and appear to influence skill execution differently, conscious motor processing and movement self-consciousness. On the one hand, conscious motor processing refers to athletes consciously controlling the underpinning mechanics of movement (e.g., reflecting upon and thinking through how best to improve the execution of a skill). On the other hand, movement self-consciousness is a less engaged form of conscious processing reflecting a tendency to be concerned with the ‘style’ of a movement such that the athlete is concerned with making a good impression when performing a skill (Masters, Eves, & Maxwell, 2005). Conscious motor processing has been most firmly implicated in the degrading of skilled motor action. However, Malhotra, Poolton, Wilson, Omuro, and Masters’ (2015) experimental golf putting data indicate that at later stages of learning, increased movement self-consciousness can aid performance by reducing variability of the putter head kinematics whereas conscious motor processing was unrelated to putting performance. With regard to the present study’s findings, two aspects are salient: First, the delivery of and the nature of self-talk cues used (“ring front, elbow, wrist”) do not segment the experimental task but instead highlight important elements for successful achievement (e.g., Mullineaux & Uhl, 2010). This is in contrast to Hardy et al.’s instructional self-talk that reinforced the segments inherent in the kicking skill. Second, our data were collected using a core basketball task in a formal setting from professional players who likely have a large investment in, and a strong identity with, their sport. Consequently, in the current situation it is not difficult to see how they might become concerned about task execution and motivated to self-present themselves positively in front of the researchers but not necessarily so anxious or the self-talk intervention so priming as to lead the current participants to consciously control execution of the task (cf. Malhotra et al.). Although this theoretically grounded explanation might have intuitive appeal, specific investigation of instructional self-talk and conscious processing is warranted. Such research would almost certainly also provide us with a greater understanding of how to use self-talk under competitive pressure something not considered in the present study; an issue that remains relatively unexplored yet has high appeal for practitioners. Researchers interested in examining self-talk and conscious processing should also consider moving beyond reliance on self-report collected data and perhaps look to potential EEG markers of consciously processing information (e.g., left temporal (T3) alpha frequency band power and left frontotemporal (T3-Fz) connectivity; for review see Cooke, 2013). In fact, the integration of movement coordination, such as that collected in the present study) and EEG data in future self-talk investigations would likely form a strong basis for subsequent studies to build off.

Although the current findings highlight the utility of instructional self-talk for skilled athletes, a few methodological issues are worth considering so as to better contextualize the data. For instance, because of the elite nature of our sample, participants of this standard are challenging to access, and when accessed, only have limited availability to collect data from. Accordingly the elite nature of the sample contributed to our relatively modest sample size, the absence of a separate control group, the small number of trials used to assess performance, and the lack of a training phase in our self-talk intervention. All of which future research should recognize in order to provide a more thorough understanding of the potential benefits (or disadvantages) of skilled athletes using self-talk. For example, it is possible that the current findings under-represent the benefit of instructional self-talk over motivational self-talk as research has reported stronger potency of self-talk interventions when they included training for the athlete regarding how to use self-talk (Hatzigeorgiadis et al., 2011). Moreover, the inclusion of only a single pre and post block of trials limits our view of the effectiveness of instructional self-talk to a comparative snap shot. Given the amount of time skilled athletes practice and compete, it is unfortunate that the longitudinal effects of self-talk are not well understood, although this presents itself as an exciting area for future investigation. Finally, our use of kinematic data affords a new understanding of how self-talk influences motor coordination. However, use of alternative methodology is recommended to better understand the more cognitive aspects of self-talk. For example, within Van Raalte, Vincent, and Brewer's (2016) sport-specific model of self-talk there is reference to the interplay between System 1 (i.e., statements that resemble first impressions, are automatic, fast, and occur effortlessly) and System 2 (i.e., verbalizations stemming from processing that is deliberate, slow, effortful, and carried out in consciously monitored fashion) self-talk. Our intervention would be classified as proactive System 2 self-talk. Use of the qualitative technique, Descriptive Experience Sample (Dickens, Van Raalte, & Hurlburt, in press), might enable researchers to better gauge how deliberate forms of (System 2) self-talk impact on System 1 processing.

The present study's unique use of movement coordination variability data and the recruitment of professional standard basketball players (albeit a small sample size) are two features that are rarely mirrored in the existing self-talk literature. Although the findings offer some assurance that some types of instructional self-talk might not disrupt execution of accuracy-base motor tasks by skilled athletes, replication is essential. This is because the potential harm of instructional self-talk for performance of those in the more automated stages of learning, especially when used under competition pressure (cf. Masters & Maxwell, 2008), could be disastrous for the performer (as well as the practitioner's employment). Drawing from recent reinvestment theory oriented goal-setting interventions (e.g., Mullen, Jones, Oliver, & Hardy, 2016) and developing practice and competition specific cues might be one way to avoid such unintended outcomes.

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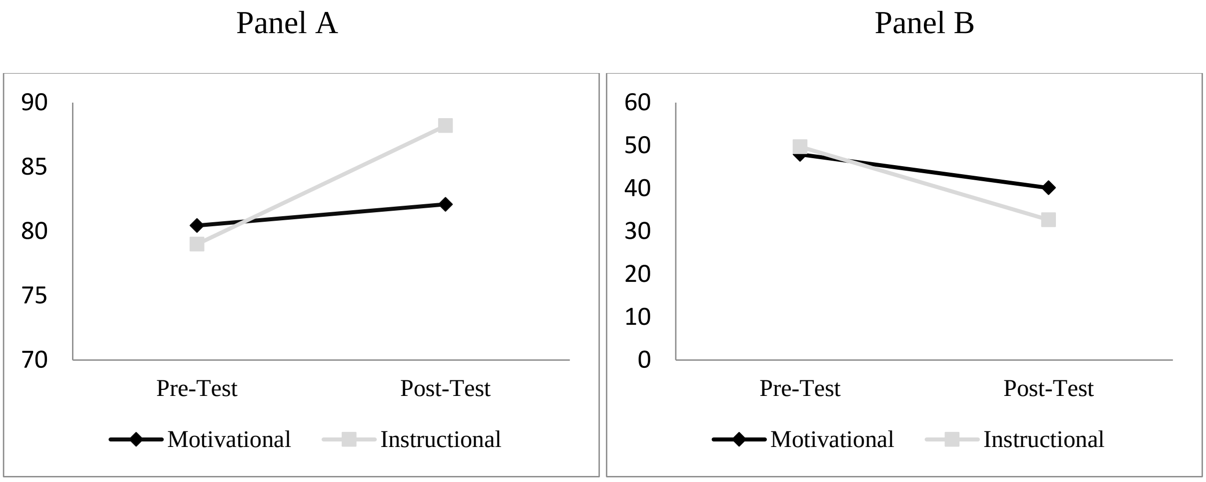

Figure 1. Differential effects of instructional and motivational self-talk on Performance accuracy (Panel A) and Movement coordination variability (Panel B)

Table 1: Central tendency statistics for accuracy and elbow-wrist movement coordination variability

Group	Condition	Performance Accurate		Movement coordination variability	
		Mean	*SD*	Mean	*SD*
Motivational self-talk	Pre-Test	80.45	5.08	47.93	13.65
	Post-Test	82.10	4.79	40.11	14.97
Instructional self-talk	Pre-Test	79.00	8.23	49.72	13.68
	Post-Test	88.20	4.51	32.68	12.03